Article

Race and Justice
2017, Vol. 7(3) 256-275

DOI: 10.1177/2153368716646163
journals.sagepub.com/home/raj
SAGE

The Impact of Police Deployment on Racial Disparities in Discretionary Searches

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Abstract

A large and growing body of research finds racial disparities in discretionary searches of drivers during traffic stops with Black drivers disproportionately involved in these investigations. Among the explanations for these disparities is the deployment hypothesis which suggests that as police departments increasingly adopt hot spots policing strategies, proactive traffic stops and discretionary searches may spatially cluster around crime hot spots contributing to racial disparities. The present study builds on the existing research literature by identifying hot spots using reported crime data from a police department and examining whether these crime hot spots function as a mediating factor to the relationship between driver race and discretionary searches. Findings provide partial support for the deployment hypothesis. While nearly half of all traffic stops transpired within one quarter mile of hot spots and more frequently involved Black drivers, stops involving Black drivers remained more likely to include discretionary searches and increased concomitantly with distance from the nearest hot spot.

Keywords

racial profiling, race and policing, traffic stops, driving while black, directed patrol, hot spots

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Introduction

When survey participants are asked whether local police vary decision-making based on race, including whether officers are more likely to stop some drivers using more minor violations, robust racial disparities emerge with Black survey respondents more frequently perceiving discriminatory treatment (Weitzer & Tuch, 1999; Wu, Lake, & Cao, 2013). While members of the public may inform their opinions regarding police decisions from a variety of sources including vicarious experiences of friends and family members or through exposure to media, previous interactions are a particularly salient factor when explaining these disparities (Weitzer & Tuch, 2005). Among the types of interactions with which members of the public may inform their opinions, the most common source of contacts is traffic stops, accounting for over 40% of police–public contacts (Langton & Durose, 2013), with interactions containing discretionary searches particularly damaging to police legitimacy due to the implication of criminal suspicion (Gau, 2012). Given the potential contribution to racial disparities in police legitimacy resulting from these contacts (Kirk, Papachristos, Fagan, & Tyler, 2012; Tyler, 2004; Weitzer & Tuch, 2005), a growing body of research focuses on the decision by officers to search drivers and vehicles (Petrocelli, Piquero, & Smith, 2003; Renauer, 2012; Schafer, Carter, Katz-Bannister, & Wells, 2006). Although there are exceptions (Smith & Petrocelli, 2001; Tillyer, Klahm, & Engel, 2012), much of the existing research identifies associations between driver race and searches, with Black drivers more frequently subject to these investigations than similarly situated White drivers (Briggs & Crew, 2013; Engel & Calnon, 2004).

In order to better understand the origins of racial disparities in traffic stop decisions, research has begun incorporating contextual factors into analyses. In particular, given the uneven distribution of reported crimes to police, one explanation given for racial disparities centers around the deployment of police resources (Engel, Smith, & Cullen, 2012; Parker, MacDonald, Alpert, Smith, & Piquero, 2004). With promising evaluations also demonstrated crime prevention benefits of directing police resources to crime "hot spots" typically comprised of intersections, blocks, or block faces (Braga & Weisburd, 2010; Sherman, Gartin, & Buerger, 1989; Sherman & Weisburd, 1995), combined with organizational changes encouraging officers to increase proactive activities in and near these hot spots (Silverman, 1999), the deployment hypothesis argues spatial variation in risk of stops and searches may differentially impact racial and ethnic groups when these locations are disproportionately identified within neighborhoods with higher proportions of racial and ethnic minority residents (Roncek & Maier, 1991; Tomaskovic-Devey, Mason, & Zingraff, 2004). Officers directing time and effort to crime hot spots may be more assertive in initiating traffic stops and investigating drivers and vehicles closer to hot spots of crime. Where hot spots are disproportionately situated in areas with higher proportions of racial and ethnic minority drivers, analyses of stop and search data are likely to identify associations between driver race and discretionary decision outcomes.

Although a handful of published research papers examining the relationship between driver race and decisions in the context of traffic stops include measures of

context including police deployment, these analyses rely on data aggregated to neighborhoods or beats. The current study builds on this research by more directly testing the deployment hypothesis. Specifically, hot spots of crime are identified using police reports from a large police department and are used to explore whether the location of traffic stops relative to hot spots of crime functions as a mediating factor to the relationship between driver characteristics and the decision to search. Before describing the data, analysis, and findings of the present study, the article begins with a description of the deployment hypothesis and a review of research examining deployment of police resources as a mediating factor to the relationship between driver characteristics and discretionary searches.

The Deployment Hypothesis

Under the deployment hypothesis, racial disparities identified in analyses of traffic stop data collected by agencies policing urban areas are the product of variation in risk for police-initiated contacts and searches driven by organizational responses to uneven distributions of criminal offending. While examining the spatial distribution of crime has been a focal point of criminological research since the 1940s, for decades this research, along with the accompanying distribution of police resources, was organized around neighborhoods (Vold, Bernard, & Snipes, 2002). Police departments organized spatially by employing beats, or area assignments for patrol officers, that encompass anywhere between several blocks and several dozen square miles (Novak & Chamlin, 2012). Densities of patrols were typically based on the distribution of crime within jurisdictions where higher crime beats or neighborhoods received higher concentrations of patrols in an effort to dissuade potential offenders and respond more quickly to reported offenses (National Research Council, 2004).

With technological developments enabling the widespread adoption of crime mapping and analysis, the focus on spatial distribution of crime began including smaller units of analysis such as blocks, street segments, and intersections. One such analysis involved mapping of calls for service down to addresses in Minneapolis (Sherman et al., 1989). Findings indicated that roughly half of calls for service originated from just 3% of addresses, suggesting that police administrators seeking to prevent crime could concentrate efforts to these locations. Significantly, it was also noted that, even within the most troubled neighborhoods, most addresses did not record a call for service during the study period (Sherman et al., 1989). With previous research finding limited impacts from increasing the density of patrols in neighborhoods on reducing rates of offending (Kelling, Pate, Dieckman, & Brown, 1974), the findings from the Minneapolis study suggested alternative crime prevention strategies including targeting patrol resources at hot spots of crime. Using a randomized controlled trial testing the directing of patrols to troubled places, Sherman and Weisburd (1995) found increasing police presence within crime hot spots lead to substantial reductions in crime and disorder. While some police departments continue disproportionately deploying patrols to entire neighborhoods in an effort to deter potential offenders, a national survey of police agencies found over half (58%) of

departments with jurisdiction populations of 50,000 or greater use crime mapping software to identify hot spots (Reaves, 2010).

Along with the changes in understanding regarding the utility of patrol strategies as a crime prevention approach, many police departments also began adopting organizational changes first implemented by the New York City police department in the early 1990s (Silverman, 1999; Weisburd, Mastrofski, McNally, Greenspan, & Willis, 2003) and often referred to as Compstat, in order to formalize systematic reviews of reported offenses and department responses using existing internal data during recurring meetings among police managers. As an organizational change, it provides incentives and accountability for officers to focus resources on problems, particularly crime hot spots. While police should arguably focus on responses that address conditions creating opportunities for offending (Kochel, 2011), a common response by departments is to direct officers to increase patrol and proactively address order maintenance issues, often solely relying on traditional law enforcement responses such as increasing contacts, becoming more assertive in conducting searches, and increasingly issuing citations and arrests in and around hot spots (Braga et al., 1999; Taylor, Koper, & Woods, 2011).

The deployment hypothesis proposes that racial disparities in searches result from departments responding to concentrated offending by focusing traffic stops and searches in and around hot spots of crime (Tomaskovic-Devey et al., 2004). While this clustering of interactions increases the risk that drivers in and around crime hot spots will be stopped and searched, this risk is expected to be race neutral where drivers of various racial groups are treated similarly (Engel et al., 2012; Tomaskovic-Devey et al., 2004). In other words, traffic stops occurring in similar proximities to hot spots of crime should contain similar levels of officer assertiveness regardless of the characteristics of the stopped drivers. Racial disparities are an expected product of uneven risk for proactive, investigatory contacts driven by spatial variation in the distribution of reported offending rather than variation in the exercise of discretionary authority across drivers of varying demographic characteristics.

Police Deployment on Racial Disparities in Stops and Searches

With analyses of the decision to conduct searches usually relying upon the population of stopped drivers (Briggs & Crew, 2013), it is noteworthy that examinations focusing on the deployment of police resources often identify a positive relationship with distributions of traffic stops (Renauer, 2012; for an exception, see Novak & Chamlin, 2012). For example, using data from Richmond, VA, Petrocelli, Piquero, and Smith (2003) find a positive association between the reported crime rate within neighborhoods and the rate of stops per neighborhood resident. Similarly, using data collected in Houston, TX, Roh and Robinson (2009) find positive a relationship between the number of officers assigned to patrol beats and the number of traffic stops recorded within beats.

Turning to the question of whether variation in patterns of police deployment contributes to racial disparities in searches, the likelihood or rate of searches is expected to be positively related to measures of police deployment rather than with driver race or ethnicity (Tomaskovic-Devey et al., 2004). This review and the analyses that follow focus specifically on discretionary searches which are officer-initiated investigations based on officer judgment (Walker, 2005). In contrast, nondiscretionary searches are typically mandatory for officers and are required by department policies (Kochel, 2011; Tillyer, 2014). While some researchers have used reasons given for initiating contacts or the dispositions of traffic stops to identify discretionary searches (Engel & Calnon, 2004; Lundman, 2004; Smith & Petrocelli, 2001), the most common technique uses the reasons provided by officers for conducting searches. Discretionary searches include consent searches, where permission is sought and received by police officers, and so-called Terry searches, named for the U.S. Supreme Court ruling giving officers the authority to conduct cursory searches of drivers and/or vehicles in order to identify potential weapons (Ridgeway, 2006; Schafer et al., 2006). Nondiscretionary searches include those conducted incident to arrest, including inventory searches performed on vehicles as part of a seizure (Alpert, Dunham, & Smith, 2008; Schafer et al., 2006).

Previous research examining whether variation in deployment mitigates the relationship between driver race and discretionary searches provides mixed support for the deployment hypothesis. After accounting for violent crime arrest rates within neighborhoods, Alpert, Dunham, and Smith (2008) find that neither driver race nor driver ethnicity to be a significant predictor of the likelihood of searches. Alternatively, after accounting for greater likelihoods of stops in neighborhoods with greater amounts of crime, the rates at which drivers are searched are higher for Black drivers than White drivers for some types of discretionary searches (i.e., Terry searches) though not others (Ridgeway, 2006). Moreover, Novak and Chamlin (2012) identify a positive relationship between a measure of police workload and the rate at which traffic stops involve searches for Black drivers. However, a similar pattern is not identified for White drivers.

Presently, the research testing whether the deployment hypothesis explains racial disparities in discretionary searches suffers from several limitations including relying on outcome measures that fail to distinguish between discretionary and nondiscretionary searches (Alpert et al., 2008; Novak & Chamlin, 2012). In addition, previous analyses of the deployment hypothesis have relied on aggregated, neighborhood, or beat-level measures of police deployment. Given that neighborhoods can be spatially large (Novak & Chamlin, 2012), have wide variation in levels of offending within them (Sherman et al., 1989), and with many larger police departments implementing hot spots policing strategies (Reaves, 2010), variation in the exercise of police discretion within neighborhoods may be lost in such analyses. The current study seeks to build on the previous research with data collected by a department using mapping to identify hot spots of crime and encouraging officers to dedicate time and effort to these areas through internal accountability mechanisms. Specifically, the current study examines whether the location of traffic stops relative to hot spots of crime mediates the relationship between driver race and the likelihood of discretionary searches.

Current Study

The deployment hypothesis proposes that traffic stops and discretionary search are expected to be concentrated around hot spots of crime with all drivers of having similar likelihoods of discretionary searches regardless of race. To test this expectation using data from a large, urban police department, the current study identifies the distance of individual traffic stops to the nearest crime hot spot, categorizes traffic stops based on these distances, and examines whether Black, Hispanic, and White drivers within each distance category have relatively similar probabilities of discretionary searches.

Study Setting

Data for the current study were collected in Minneapolis, MN. At the time of data collection, the police department was using crime mapping and Compstat processes that encouraged officers to direct time and contacts in and around hot spots of crime (Willis, Mastrofski, & Weisburd, 2004). At the start of shifts, officers were provided crime maps and ordered to "use their uncommitted time for directed patrol and to focus on making arrests for even minor breaches of the law in order to reduce serious crime" (Willis et al., 2004, p. 12). Given the widespread adoption of using crime mapping to identify hot spots of crime by departments combined with frequent use of internal accountability mechanisms such as Compstat for monitoring crime levels and deployment of department resources (Reaves, 2010), the study setting is representative of current, common crime prevention strategies.

Data Collection Procedures

Data on individual traffic stops were recorded by officers using computers mounted in patrol cars for all proactive traffic stops taking place between January 1, 2002, and December 31, 2002, and were provided to the researchers by the Institute on Race and Poverty at the University of Minnesota School of Law. In order to collect data, a system was established where the data collection instrument would appear on mobile data terminals in every instance where officers reported the initiation of traffic stops to dispatchers (Institute on Race & Poverty, 2003). Officers could not clear the instrument from their mobile data terminals until it was completed. In extraordinary situations, such as officers being dispatched to another location, dispatchers could temporarily clear the data collection instrument and officers were asked later to complete them (Institute on Race & Poverty, 2003).

The current study focuses on cases where traffic stops were initiated by officers for moving, equipment, or registration violations and the data collection instrument was completed.[1] The study is limited to contacts involving White, Black, and Hispanic drivers while traffic stops involving Native American ($n = 813$) and Asian or Pacific Islander drivers ($n = 1{,}802$) are excluded due to insufficient number of contacts for analysis. Finally, with the current analysis focusing on

how the location of police–public contacts relative to hot spots of crime impacts racial and ethnic disparities in discretionary searches, interactions involving non-discretionary searches were excluded from analyses.[2] The sample of contacts in the current analysis includes 39,547 stops involving 1,324 discretionary searches.

Distance to Crime Hot Spots

To identify hot spots of crime, the Minneapolis Police Department provided locations, either by address or by street intersections, for 76,915 reported crimes in calendar year 2002 based on incident reports completed by officers. Reported crimes consist of both Uniform Crime Report (UCR) Part I violent and property crimes and other offenses including reports of drug offenses, vandalism, disorder, and loitering.[3] Using ArcGIS 10, these reports were geocoded with a 98.5% match rate. Unfortunately, neither the hot spots identified by the crime analysis unit at the Minneapolis Police Department nor the methods of identifying hot spots at the time that the traffic stop data were collected could be determined by the authors.[4] As a result, a series of decisions regarding the techniques used to identify crime hot spots were required. The reasoning behind the decisions that follow was based on two criteria. First, previous research finds that about 3% of locations accounted for between one quarter and one half of all of reported offenses (Braga & Bond, 2008; Sherman et al., 1989). Second and more importantly, previous experiments in directed patrol conducted in collaboration between researchers and police practitioners have reported caution among commanding officers in assigning too many hot spots for increased police activity. For example, in a randomized controlled trial of directed patrol in Minneapolis, it was noted that "the department could not handle 100 target hot spots ... and asked [the researchers] to reduce the experimental group to 50" (Sherman & Weisburd, 1995, p. 632).[5] Similarly, an evaluation of directed patrol strategies compared to problem-oriented policing strategies in Jacksonville, FL, targeted 43 hot spots (Taylor et al., 2011).

Hot spots were identified using the Nearest Neighbor Hierarchical Spatial Clustering tool in Crimestat 3.2a. This technique was selected as it works in conjunction with mapping software, ArcGIS, that is commonly used by crime analysts, it is easily adjustable to in producing results that fit the criteria for identifying outlined above, and the output includes maps that contain ellipses that are common in Compstat presentations. Under the goals outlined above, the minimum points per cluster were set to 200 with a single standard deviation for the ellipses. The identified hot spots contain 6.1% of the city and 34% of all reported crimes.[6] The number of hot spots per district ranged from 7 to 15 with a total of 61 hot spots across the five department districts. The distance from each individual traffic stop to the center of the nearest hot spot was linear and identified in feet. Using the distances to the center of the nearest hot spots, traffic stops were then categorized as taking place within a quarter of a mile of a hot spot, between a quarter and half of a mile, between half of a mile and a mile, and greater than a mile.

Study Design

To examine whether the possible concentration of traffic stops and discretionary searches around hot spots of crime explains racial disparities in discretionary searches, the current study first presents the frequency of traffic stops by driver race in various categorical distances. Although these data do not inform whether the population of stopped drivers is biased from selection processes (Walker, 2001), it functions as the baseline for comparison against the population of drivers whose interactions include discretionary searches. More direct to the deployment hypothesis as an explanation of racial disparities in discretionary searches, these frequencies enable the exploration of whether discretionary searches are also more concentrated around crime hot spots. Finally, using multivariate regression models, the relationship between driver race and discretionary searches is examined among stops occurring within similar categorical distances from crime hot spots.[7]

Dependent variable. When officers indicated that searches of drivers, passengers, and/or vehicles were conducted in the course of traffic stops, they were asked to select from several discretionary reasons for searches, including consent to search form, driver gave verbal permission, and officer safety, or nondiscretionary reasons such as incident to arrest and contraband observed. Categorization into discretionary and nondiscretionary searches replicates previous research (see Schafer et al., 2006) and is based on whether searches are conducted based on officer selection or are required by department policies. Traffic stops with discretionary searches were coded 1 and all other traffic stops were coded 0.

Independent variables. In addition to whether a search was conducted and the reason for the search, officers were asked to collect information regarding driver and situational characteristics for each traffic stop. Driver characteristics included the age, gender, and race or ethnicity of each stopped driver. Previously published research focusing on whether the race or ethnicity of drivers contributed to discretionary decisions in traffic stops has noted the importance of identifying how officers perceive the drivers rather than how the drivers identify themselves (Batton & Kadleck, 2004; Ramirez, McDevitt, & Farrell, 2000). Racial and ethnic characteristics of drivers were likely based on officer perception. Indeed, driver's licenses in the state of Minnesota have never included information regarding the race or ethnicity of the licensee.[8] The data collection instrument limited officers to categorizing drivers into a single race or ethnicity.[9] Officer classifications of driver race and ethnicity were coded into the series of dummy variables *Black, Hispanic*, and *White* with *White* functioning as the reference category in multivariate models. Age is measured using a series of dummy variables, *15–18, 19–29, 30–39,* and *40 and up,* replicating those used by Ridgeway (2006). In multivariate analyses, *15–18* functions as the reference category. Similarly, the driver gender variable male was coded 1 for when officers categorized drivers as male and 0 when female.

Several situational characteristics may also influence the likelihood of discretionary searches in traffic stops including the initial reason for the stop and the time of

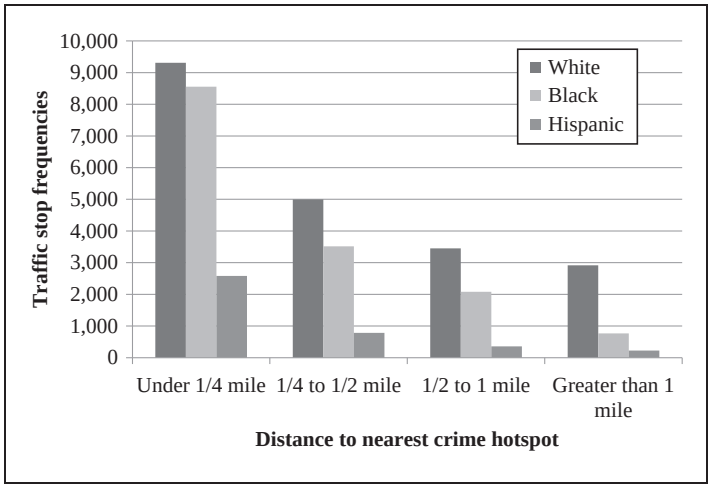

Figure 1. Traffic stops by race and distance to nearest crime hot spot.

the interaction. Some have argued police may use less serious traffic violations as a reason to initiate traffic stops in order to further investigate drivers, often referred to as pretextual stops (Harris, 2002). In the current study, the initial reasons for stops are categorized in the variable *equip/reg* with stops for equipment and registration violations coded 1 and stops initiated for moving violations such as *speeding* coded 0. Similarly, to account for the time of each traffic stop, a series of variables were created using 4-hr increments, *12 a.m.–4 a.m.*, *4 a.m.–8 a.m.*, *8 a.m.–12 p.m.*, *12 p.m.–4 p.m.*, *4 p.m.–8 p.m.*, *8 p.m.–12 a.m.*, replicating previous research (see Ridgeway, 2006), with *12 a.m.–4 a.m.* as the reference category in multivariate models.

Results

Under the deployment hypothesis, stops are expected to cluster near hot spots of crime. Based on the results presented in Figure 1 where just over half (51.7%) of all traffic stops taking place within one quarter mile of crime hot spot, this expectation is supported. Without appropriate baselines for comparison, it is unknown whether the racial proportions of drivers stopped are representative of the offending populations in these areas of the community (Walker, 2001). However, the findings presented in Figure 1 are significant. As noted above, the identification of hot spots used in the analyses that follow was identified by the authors rather than using hot spots identified within the department at the time the traffic stop data were collected. The results in Figure 1 indicate that proactive contacts were highly concentrated within and near the hot spots identified by the authors. Moreover, the volume to traffic stops drops concomitantly with distance from hot spots. If the location of hot spots was misidentified, one would not expect to find the distribution of stops presented here.

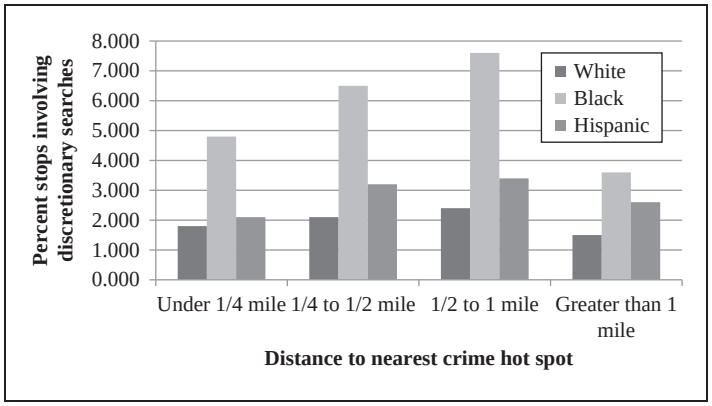

Figure 2. Percentage of stops resulting in discretionary searches by race and distance to nearest crime hot spot.

With traffic stops typically functioning as the baseline for examinations of discretionary searches, one noteworthy result of Figure 1 is that more White drivers were stopped than Black or Hispanic drivers across each of distance to the nearest crime hot spot category. Conversely, compared to the volumes of stops across the remainder of the community, greater proportions of Black (8,556 of 14,921 or 57.3%) and Hispanic (2,581 of 3,949 or 65.4%) drivers are stopped closer to hot spots of crime than White drivers (9,331 of 20,667 or 45.0%).

With the focus of this article on testing whether the deployment hypothesis explains racial disparities in discretionary searches, Figure 2 presents that rates at which drivers are searched by race and by distance to the nearest hot spot of crime. Under the deployment hypothesis, racial disparities are the expected result of concentrations of discretionary searches near hot spots of crime with similarly situated drivers searched at the same rate. The results in Figure 2 do not suggest that traffic stops taking place closer to hot spots more frequently involve discretionary searches. Rather, the rates of traffic stops including discretionary searches increases as distance to nearest hot spots increases up to 1 mile before the rate of searches declines. Furthermore, results in Figure 2 suggest that minority drivers, particularly Black drivers, are disproportionately involved in this type of interaction. Moreover, racial disparities in search rates appear to increase concomitantly with distance from the nearest crime hot spot up to 1 mile in distance and then decrease.

In addition to location, there are a variety of other factors, including the time of traffic stops and reasons for which stops are initiated, possibly contributing to disparities in discretionary searches. Table 1 provides descriptive statistics for each of the variables in the multivariate models.

As previously noted, the proportion of traffic stops including discretionary searches varies based on the distance from the nearest crime hot spot. In traffic stops closest to hot spots of crime, about 3% of stops include discretionary searches. Previous research focusing on discretionary searches typically reports search rates between 3% and 6%

Table 1. Descriptive Statistics.

	Under ¼ Mile		¼ to ½ Mile		½ to 1 Mile		Greater Than 1 Mile	
Distance to Nearest Crime Hot Spot	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Discretionary search	.03	.17	.04	.19	.04	.20	.02	.14
Equip/reg	.38	.48	.34	.47	.34	.47	.28	.45
Black	.42	.49	.38	.48	.35	.48	.20	.40
Hispanic	.13	.33	.08	.28	.06	.24	.06	.23
White (reference category)	.46	.50	.54	.50	.59	.49	.75	.44
15–18 (reference category)	.03	.17	.35	.18	.05	.21	.06	.24
19–29	.47	.50	.46	.50	.44	.50	.40	.49
30–39	.27	.44	.26	.44	.25	.44	.24	.43
40 and above	.23	.42	.24	.43	.26	.44	.30	.46
Male	.75	.43	.72	.45	.70	.46	.68	.47
12 a.m.–4 a.m. (reference category)	.20	.40	.18	.39	.17	.38	.16	.37
4 a.m.–8 a.m.	.04	.20	.04	.20	.04	.20	.04	.19
8 a.m.–12 p.m.	.11	.31	.11	.31	.10	.30	.12	.33
12 p.m.–4 p.m.	.10	.30	.12	.32	.11	.31	.12	.33
4 p.m.–8 p.m.	.20	.40	.22	.41	.23	.42	.20	.40
8 p.m.–12 a.m.	.35	.48	.33	.47	.35	.48	.35	.48
n cases	20,448		9,295		5,893		3,911	

Note. Equip/reg = equipment/registration.

of traffic stops (Fallik & Novak, 2012; Ridgeway, 2006; Tillyer & Klahm, 2015). The rate of traffic stops including discretionary searches increases to 4.3% for stops occurring between one half and one mile distance from the nearest hot spot before declining to 2% of interactions occurring at 1 mile or greater. In contrast, the rate of stops initiated for equipment and registration violations is highest near crime hot spots and declines, though not a perfect linear fashion, as distance increases.

With a dichotomous dependent variable, a series of logistic regressions are used to examine the relationship between driver race and the likelihood of discretionary searches. A separate model is run for each distance increment. Results of these logistic regressions are presented in Table 2 where individual models were run using data from all stops within the categorical distance.

The results in Table 2 are mixed regarding support for the deployment hypothesis. Results associated with the variable *Hispanic* indicate that stops involving Hispanic drivers have a similar likelihood to White drivers of involving discretionary searches, a finding supportive of the deployment hypothesis. In contrast, results also indicate traffic stops with Black drivers are consistently more likely than similarly situated White drivers to include discretionary searches and that these disparities increase with distances from hot spots up to 1 mile before decreasing slightly, though disparities remain beyond 1 mile. This finding does not support deployment hypothesis.

In addition to racial disparities, findings in Table 2 also indicate stops with younger drivers and male drivers also disproportionately included discretionary searches.[10]

Table 2. Logistic Regressions of Discretionary Searches.

Distance to Nearest Crime Hot Spot	Model 1: Under ¼ Mile			Model 2: ¼ to ½ Mile			Model 3: ½ to 1 Mile			Model 4: Greater Than 1 Mile		
Variables	Coefficient	*SE*	Odds Ratio	Coefficient	*SE*	Odds Ratio	Coefficient	*SE*	Odds Ratio	Coefficient	*SE*	Odds Ratio
Intercept	−3.776***	0.231	0.023	−3.251	0.270	0.039	−3.250***	0.306	0.039	−3.515***	0.470	0.030
Equip/reg	−0.56	0.084	0.945	0.233*	0.112	1.263	0.102	0.135	1.108	−0.046	0.251	0.955
Black	0.918***	0.093	2.504	1.080***	0.123	2.943	1.118***	0.141	3.059	0.707**	0.250	2.027
Hispanic	−0.048	0.161	0.953	0.183	0.230	1.201	0.068	0.318	1.070	0.288	0.450	1.334
19–29	−0.483*	0.190	0.617	−0.686**	0.212	0.504	−0.673**	0.229	0.510	−0.265	0.375	0.767
30–39	−0.699***	0.198	0.497	−1.136***	0.232	0.321	−1.333***	0.263	0.264	−1.214*	0.461	0.297
40 and up	−0.814***	0.204	0.443	−1.422***	0.251	0.241	−1.441***	0.273	0.237	−1.508*	0.482	0.221
Male	0.760***	0.121	2.139	0.684***	0.150	1.982	0.745***	0.179	2.106	0.388	0.283	1.475
4 a.m.–8 a.m.	0.089	0.202	1.093	−0.806*	0.400	0.447	0.471	0.308	1.602	−17.278***	3176.210	0.000
8 a.m.–12 p.m.	−0.368*	0.164	0.692	−0.581*	0.233	0.560	−0.876*	0.369	0.417	−0.784	0.565	0.457
12 p.m.–4 p.m.	−0.375*	0.165	0.687	−0.787**	0.236	0.455	−0.696*	0.310	0.499	−0.752	0.515	0.471
4 p.m.–8 p.m.	−0.362**	0.132	0.696	−0.335*	0.167	0.715	−0.106	0.204	0.899	0.033	0.344	1.034
8 p.m.–12 a.m.	−0.070	0.105	0.932	−0.131	0.140	0.877	0.057	0.176	1.059	−0.029	0.299	0.971
Model χ^2	223.367***			208.630***			170.742***			50.930***		
Psuedo-R^2	.045			.080			.095			.013		

Note. Equip/reg = equipment/registration.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Predicted Probabilities of Discretionary Searches.

	Under ¼ Mile	¼ to ½ Mile	½ to 1 Mile	Greater Than 1 Mile
Noon to 4 p.m.				
White[a]	1.9%	4.2%	4.3%	1.9%
Hispanic	1.8	5.0	4.6	2.6
Black	4.6	11.5	12.1	3.9
Midnight to 4 a.m.				
White	2.7	8.8	8.3	4.0
Hispanic	2.6	10.4	8.8	5.3
Black	6.5	22.2	22.0	7.8

[a]Male drivers under age 18 stopped for equipment/registration violations.

Likewise, though less consistent, stops during daylight hours (between 8:00 a.m. and 8 p.m.) were often less likely to include discretionary searches. In contrast, the reason given for initiating traffic stops was often not related to whether officers pursued this type of additional investigation.

To further examine the racial disparities in discretionary searches presented in Table 2, using the results from the logistic regression models, probabilities of traffic stops including this type of search were calculated and are presented in Table 3. Each column in this table represents distances from the traffic stops to the nearest crime hot spots. Probabilities are calculated for White and Black male drivers under the age of 18 for stops initiated for equipment or registration violations occurring either during early afternoon hours (between noon and 4:00 p.m.) or at night (between 12:00 a.m. and 4:00 a.m.).

The predicted probabilities in Table 3 more clearly indicate three patterns: the likelihood that a stop includes a discretionary search increases concomitantly with distance from hot spots, there is generally a tiered effect with Black drivers more likely to be searched than Hispanic drivers and Hispanic drivers more likely than White drivers, and that racial disparities in this decision are not simply the result of patterns in police deployment. As can be seen in Table 3, the likelihood that a stop involving a young Black male driver stopped for an equipment or registration violation included a discretionary search increased from 6.5% for stops occurring within one quarter of a mile from a crime hot spot up to 22% for stops occurring between one half and one mile from the nearest hot spot. While similar increases in the likelihood of searches with distance is also present for Hispanic and White drivers, there is also generally a tiered effect with predicted probabilities of Hispanic drivers being searched usually falling between White and Black drivers, though more closely to White drivers. Finally, racial disparities in predicted probabilities of discretionary searches are present in traffic stops occurring near hot spots and also slightly increase with distance up to 1 mile before diminishing. For example, for traffic stops occurring closest to hot spots, young Black drivers are 2.4 times more likely to have a traffic stop include a discretionary search than similarly situated White drivers. For traffic stops occurring between one half mile and one mile from hot spots, young Black drivers are

predicted to be searched at 2.8 and 2.6 times the rate of similarly situated White drivers in the afternoon and at night, respectively. For stops taking place 1 or more miles from crime hot spots, disparities in search rates persist, though the difference is slightly diminished with young Black drivers searched at about twice the rate of young White drivers.

Discussion

Given the proactive nature of traffic stops and limited guidance from department policies or court decisions regarding the selection of drivers for searches (Walker, 2005), police officers often have a great deal of discretion in this decision (Reiss, 1971). Research focusing on how this authority is exercised usually finds stops of Black drivers are more likely to include discretionary searches (Briggs & Crew, 2013; Tillyer, 2014). The deployment hypothesis proposes that these disparities are the result of greater police presence and proactivity in conducting searches within higher crime areas when those areas are disproportionately traversed by racial and ethnic minority drivers. Specifically, with experiments finding that the directing of police patrols, stops, and searches may reduce criminal offending (Sherman & Rogan, 1995; Sherman & Weisburd, 1995; Sorg, Haberman, Ratcliffe, & Groff, 2013), racial disparities in discretionary searches may result when crime hot spots are disproportionately located in areas of communities with greater proportions of racial and ethnic minority residents and drivers (Roncek & Maier, 1991; Sherman et al., 1989). Where racial disparities in discretionary searches are identified, they are expected to result from higher concentrations of stops and searches that are selected in a racially neutral manner (Parker et al., 2004).

The current study provides limited support for the deployment hypothesis. Under the expectation that traffic stops will be concentrated near crime hot spots, the current study finds that just over half of all stops occurred within one quarter mile of a hot spot. This finding is similar to previous research based on neighborhoods which also find positive associations between crime rates and rates of stops (Petrocelli et al., 2003; Renauer, 2012; Roh & Robinson, 2009) and is supportive of the deployment hypothesis. In addition, traffic stops occurring during nighttime hours, particularly between midnight and 4 a.m., were about twice as likely to include discretionary searches as similar stops occurring in the 4-hr time period following noon and replicating a finding found in other analyses using traffic stops as the unit of analysis (Fallik & Novak, 2012; Tillyer & Klahm, 2015). This could be the result of officers with less experience, who may also be more assertive in conducting discretionary searches, disproportionately assigned to nighttime shifts (Tillyer & Klahm, 2015). In regard to the deployment hypothesis, this finding also suggests an important temporal element.

Evidence from the current study is not supportive of the expectations that stops taking place closer to hot spots of crime are more likely to include discretionary searches and that this decision is race neutral. Rather, the findings in the current study indicate the likelihood of a stop including a discretionary search increases with

distance from the nearest hot spot up to 1 mile before diminishing and that stops involving Black drivers are more likely to include discretionary searches. The finding regarding the likelihood of searches increasing with distance from crime hot spots contradicts previous research focusing on the relationship between the deployment of police resources and rates of searches per stops (Petrocelli et al., 2003; Roh & Robinson, 2009; for an exception see Novak & Chamlin, 2012). One possible reason for the incongruity in findings lies in variation of the unit of analysis used across studies. Whereas the current analyses centered on more closely measuring the distance from each contact to areas of concentrated offending, previous research on this topic has relied on neighborhoods as the unit of analysis. As previously noted, neighborhoods can range in size up to several dozen square miles (Novak & Chamlin, 2012). Analyses conducted with larger areas may suffer from aggregation bias resulting in different findings from those presented here.

Few other studies examine whether patterns of police deployment contribute to racial disparities in discretionary searches. These studies have produced mixed results with some supporting the deployment hypothesis by finding the selection of drivers for searches to be race neutral after accounting for neighborhood crime rates (Alpert et al., 2008). Other researchers have reached different conclusions. Namely, some have found that Black drivers are more likley to be searched, including in higher crime areas (Novak & Chamlin, 2012; Ridgeway, 2006). The current study adds to the literature by using a more spatially refined measure of locations of stops that is more reflective of the common crime prevention practice of directed patrol (Reaves, 2010) and finds that racial disparities in discretionary searches are present within and immediately around crime hot spots. Moreover, these disparities increase with distance up to 1 mile from hot spots before diminishing. Together, these findings are not supportive of the idea within the deployment hypothesis that racial disparities in poststop outcomes, such as discretionary searches, can be mitigated by measures of deployment.

Alternatively, a growing body of research indicates that disparities in poststop outcomes, such as discretionary searches, may be the result of social conditioning (Tillyer et al., 2012). Given the uneven size of disparities identified in the current study, we suggest future research more closely examine how measures of implicit bias, including through the exericise of discretionary authority of conducting searches within traffic stops, are conditioned by situational characteristics of interactions including measures of police deployment. The finding that likelihoods of discretionary searches increase with distance from crime hot spots may also indicate variation in working group expectations or available time to officers to expend on these type of investigations (Klinger, 1997). Similarly, additional stop-level factors, such as criminal histories (Ridgeway, 2006; Tillyer, 2014), may also contribute to the decision by officers to conduct this type of search. Due to limitations of the data collection instrument, these additional stop-level factors could not be included within the current analyses. Future examinations of the deployment hypothesis would benefit by including these additional measures.

The traffic stop data used in this current study contain valuable geographic identifiers, making these analyses possible but were not without limitations. The reason for

the search is a measure of both the decision to exercise discretionary authority by officers and compliance by drivers whereby officers must request a search and drivers must consent to the request. Traffic stops where officers placed requests for searches with drivers who were not granted by drivers were not identified. In addition, the findings presented here are from a single jurisdiction. At a minimum, caution should be noted when generalizing to other communities. Furthermore, we did not use hot spots identified by the police department to provide officers direction to spend their time and efforts. Rather, the current study relied upon police reports provided by the department to the researchers to identify hot spots of crime. While it is possible that this method misidentified where officers were directed, it is noteworthy that over half of all traffic stops within the jurisdiction occurred within one quarter mile of the hot spots identified by the researchers.

The current study was conducted with data from a department whose management was actively engaged in identifying hot spots and encouraging officers to direct time and attention to these areas (Willis et al., 2004). Among the concerns that have been raised regarding the directing of police resources to crime hot spots, one of the more consistent criticisms is that these types of strategies contribute to disparate treatment (Kochel, 2011; Rosenbaum, 2006). While additional research is needed to examine the breadth of concerns, our findings suggest that the deployment strategies by police did not contribute to disparities in discretionary searches in a manner hypothesized under the deployment hypothesis. Future research would benefit from examining stop and search patterns over time within a jurisdiction to see how various crime prevention strategies, such as directed patrol, impact disparities in discretionary searches.

Acknowledgments

We thank the Institute on Race and Poverty at the University of Minnesota and the Minneapolis Police Department. Without the cooperation of these entities in sharing their valuable data, this study would not have been possible.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Notes

1. Reactive contacts were removed due to variation in available discretion based on the presence and preference of members of the public involved in such contacts. Officers were also given a categorical response of "other" where they then prompted to provide additional information. Responses that clearly fit proactive traffic stops were recoded and included in analyses. The remaining cases were too varied to categorize and too heterogeneous for interpretation to include in analyses.

2. The data collection instrument allowed for officers to indicate only one reason for up to three searches (driver, vehicle, and passenger). Without indicators of timing or data on variation in reasoning, the data in this analysis cannot be used to determine whether discretionary searches lead to additional nondiscretionary searches.
3. At the time the traffic stop data were collected, observers noted that the crime analysis unit generated maps that "generally included a range of Part I violent and property offenses" (Willis et al., 2004, p. 49). Given the uncertainty as to what other offenses may have also been included combined with inefficient communication of this information to patrol officers noted below, a more inclusive selection criteria were employed in identifying crime hot spots for the analyses that follow.
4. Results of a review of procedures and processes undertaken at the time that the traffic stop data were collected raise doubts regarding how precise of direction patrol officers were given. The review notes that even though hot spot maps were featured prominently in department operations, "district commanders limited their analysis to the time and location of individual crime incidents . . . based upon examination of these clusters, they implemented their response" (Willis et al., 2004, p. 55). In addition, the review found "that the data component of Compstat had not 'filtered' or 'trickled' down to the street level" (Willis et al., 2004, p. 57).
5. Ultimately, the experiment involved directed patrols to 55 crime hot spots.
6. With targets for spatial proportion of the community and proportion of reported crimes that should be contained within identified hot spots based on previous research as well as numbers of hot spots per precinct that police policy makers have stated can be reasonably addressed, several points per cluster specifications were initially tested. Two hundred points per cluster was selected, as it returned the closest fit to the parameters outlined above.
7. One concern with analyses examining whether neighborhood characteristics are associated with outcomes is spatial autocorrelation where the likelihood of a phenomenon occurring is not independent of the frequency in adjoining neighborhoods. Although there are a variety of techniques available for diagnosing and adjusting for this problem, these techniques are limited to area data (Paynich & Hill, 2010). The focus of the current study centers on individual contacts, or point data, where such diagnostic tests or adjustments are not available with a dichotomous outcome variable (e.g., see Ingram, 2007).
8. Personal communication between authors and state agency responsible for issuing driver's licenses.
9. Driver race and ethnicity were combined in the data collection instrument. Officers were to select from the following categories: American Indian/Native American, Asian or Pacific Islander, Black, Latino, and White.
10. Each model was also run with age as a continuous variable which produced results substantially similar to what is presented in Table 2. Results of these analyses are available upon request.

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